

# Federation Management Technical Exchange

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# Agenda

- Purpose of Briefing
- Background on MOM Concept
- Review of Existing MOM elements
- Review of Service interactions
- Review of Proposed MOM enhancements

# Purpose of Technical Exchange on 10/22/97

- Reviewed assessment of RTI-supplied MOM data for inclusion in HLA Interface Specification 1.3
- Established priorities for retaining existing elements and including new elements
- Assumptions
  - Selected MOM data will become a required part of all RTIs
  - Federate provided MOM data was not considered
  - Implementation of MOM elements will be left to implementers
  - Decision whether to include in the Interface Specification will be based on
    - Priority
    - Cost to implement
    - Impact on RTI performance
    - Appropriateness to RTI functionality

# Background

## MOM Concept

- MOM provides a mechanism that allows a federate to monitor and control a federation
  - Uses the HLA paradigm
    - Management data is exchanged in the same way as other HLA data
    - Objects, attributes, and interactions are available for publishing and subscribing
  - Objects and attributes provide information that lets a federate
    - Monitor the health of the federation as a whole
    - Monitor the health and functioning of individual federates
  - Interactions provide controls that let a federate
    - Extract specific information to diagnose problems
    - Correct inconsistencies caused by software and network anomalies

# Background

## MOM Elements

- **manager.federate** object class
  - One object instance for each federate
  - Provided by the RTI <“publish” and “update”>
  - Contains
    - identifying information about federate
    - federate time state
    - RTI queue status for federate
- **manager.federation** object class
  - One object instance for federation
  - Provided by the RTI
  - Contains identifying information about federation

# Background

## MOM Elements (Cont'd)

- **manager.federate** interaction class
  - **Request** subclass interactions
    - Acted on by the RTI <“subscribed”>
    - Cause the RTI to generate `manager.federate.report` interactions that describe aspects of RTI state associated with a federate (e.g., which attributes the federate is publishing for which object instance).
  - **Adjust** subclass interactions
    - Acted on by the RTI <“subscribed”>
    - Adjust the way the RTI performs when responding to a federate (e.g., enabling logging of RTI activities)
  - **Report** subclass interactions
    - Produced by the RTI <“published” and “generated”>
    - Generate interactions that respond to request interactions.
  - **Service** subclass interactions
    - Acted on by the RTI <“subscribed”>
    - Invoke RTI services on behalf of another federate (e.g., change interaction transportation type).

# Methodology for Review

- Evaluate MOM elements against established criteria
- Criteria
  - **Present:** Data or action is already represented in the RTI
  - **Unique:** RTI is the only source of data or implementer of actions
  - **Needed:** Need for services is established by practical prototyping
  - **Fast:** Speed of RTI is not degraded by MOM activities
  - **Simple:** Complexity of RTI software is not increased
  - **Clear:** User products are not more difficult to understand
  - **Standard:** Data and actions adhere to HLA service definitions
  - **Known:** Prototyped
- Consider input from current and future MOM users
  - Federation Management Tool
  - STOW DEM
  - ALSP CMT
  - Compliance Testing
  - Logica FOM Reader tool
  - MOM Specification v0.1

# Review of Current MOM Elements

## manager.federate object attributes

	MOM?	Present	Unique	Needed	Fast	Simple	Clear	Standard	Known
Federate host	Retain	✓	NO[1]	✓	✓	✓	✓	✓	✓
Federate state	Retain	✓	✓	✓	✓	✓	✓	✓	✓
Federate name	Retain	✓	NO[1]	✓	✓	✓	✓	✓	✓
RTI version	Retain	✓	✓	✓	✓	✓	✓	✓	✓
Time manager state	Retain	✓	✓	✓	✓	✓	✓	✓	✓
Federate lookahead	Retain	✓	✓	✓	✓	✓	✓	✓	✓
Federate time	Retain	✓	✓	✓	✓	✓	✓	✓	✓
Time constrained	Retain	✓	✓	✓	✓	✓	✓	✓	✓
Time regulating	Retain	✓	✓	✓	✓	✓	✓	✓	✓
Dequeue FIFO async	Retain	✓	✓	✓	✓	✓	NO	✓	✓
FIFO length	Retain	✓	✓	✓	✓	✓	✓	✓	✓
TSO length	Retain	✓	✓	✓	✓	✓	✓	✓	✓
Total object count	Retain	✓	✓	✓	✓	✓	✓	✓	✓
Holding tokens count	Delete	✓	✓	???	✓	✓	NO	✓	✓
Deleted object count	Delete	✓	✓	???	✓	✓	NO	✓	✓
Number of attributes	Delete	✓	✓	NO	✓	✓	NO	✓	✓
Number of parameters	Delete	✓	✓	NO	✓	✓	NO	✓	✓

[1] While federate host and federate name are not uniquely available from the RTI, including them in the object adds convenience for little cost.



# Review of Current MOM Elements

## manager.federation object attributes

	<b>MOM?</b>	<b>Present</b>	<b>Unique</b>	<b>Needed</b>	<b>Fast</b>	<b>Simple</b>	<b>Clear</b>	<b>Standard</b>	<b>Known</b>
Federation name	Retain	✓	NO	✓	✓	✓	✓	✓	✓
Federation state	Retain	✓	✓	✓	✓	✓	✓	✓	✓
Federates in federation	Retain	✓	✓	✓	✓	✓	✓	✓	✓
Save is scheduled	Retain	✓	✓	✓	✓	✓	✓	✓	✓
Scheduled save time	Retain	✓	✓	✓	✓	✓	✓	✓	✓
RTI version	Retain	✓	✓	✓	✓	✓	✓	✓	✓

# Review of Current MOM Elements

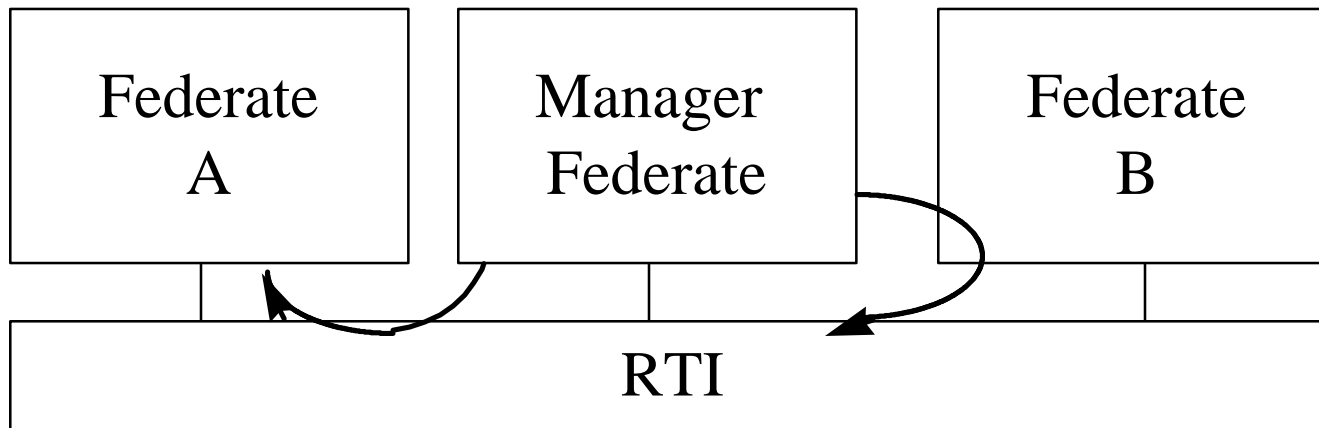
## manager.federate interactions

	MOM?	Present	Unique	Needed	Fast	Simple	Clear	Standard	Known
Request subclass	Retain	✓	✓	✓	✓	✓	✓	✓	✓
Adjust subclass	Retain	✓	✓	✓	✓	✓	✓	✓	✓
Report subclass	Retain	✓	✓	✓	✓	✓	✓	✓	✓
Service subclass	Retain	✓	✓	✓	✓	✓	✓	✓	✓

- Subclass organization is new but interactions contained in them are not.
- Service subclass interactions invoke RTI services on behalf of another federate (e.g., change interaction transportation type). Additional study is needed to determine which services should be included in the service subclass.

# Review of Service Interactions

- These interactions provide a manager federate with the ability to invoke RTI services on behalf of another federate
  - Manager federate causes the RTI to invoke a callback to Federate A.
  - Manager federate causes the RTI to react as if a service was invoked by Federate B.



- Several service interactions (renamed) are in RTI v1.0.

# Review of Service Interactions Recommended for Inclusion

## **Federation Management**

Resign Federation Execution \*  
Initiate Pause †  
Pause Achieved  
Initiate Resume †  
Resume Achieved  
Initiate Federate Save †  
Federate Save Begun  
Federate Save Achieved  
Federate Save Not Achieved  
Initiate Restore †  
Restore Achieved  
Restore Not Achieved

## **Declaration Mangement**

Publish Object Class  
Unpublish Object Class  
Publish Interaction Class  
Unpublish Interaction Class  
Subscribe Object Class Attributes  
Unsubscribe Object Class  
Subscribe Interaction Class  
Unsubscribe Interaction Class

<p>† = Callback by RTI to federate * = Prototyped in existing tools</p>
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# Review of Service Interactions Recommended for Inclusion

## **Object Management**

Delete Object \*  
Change Attribute Transportation Type  
Change Attribute Order Type  
Change Interaction Transportation Type  
Change Interaction Order Type

## **Ownership Management**

Request Attribute Ownership Divestiture

## **Time Management**

Enable Time Regulation \*  
Disable Time Regulation \*  
Enable Time Constrained \*  
Disable Time Constrained \*  
Change Lookahead \*  
Time Advance Grant †

† = Callback by RTI to federate  
\* = Prototyped in existing tools

# Review of Other Enhancements Recommended for Inclusion

<b><u>Feature</u></b>	<b><u>Type</u></b>	<b><u>MOM element</u></b>
• Min Next Event Time	attribute	Federate object
• LBTS	attribute	Federate object
• Federation time	attribute	Federation object
• Name/time of next, last federation save	attribute	Federation object
• Count of updates, interactions received	interaction	Federate report
• Count of updates, interactions sent	interaction	Federate report
• Count of objects owned	interaction	Federate report
• Count of objects being updated	interaction	Federate report
• Count of objects being reflected	interaction	Federate report
• Subscription tree	interaction	Federate report
• Publishing tree	interaction	Federate report